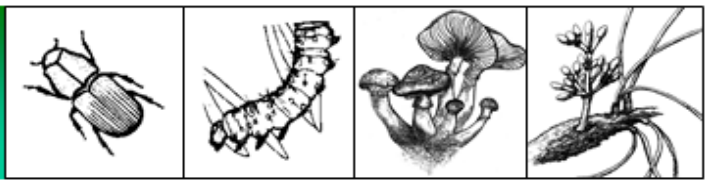
Forest Health Protection



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Evaluation of Trapping and Tree Wrapping as Management Tools to Reduce Damage from Sequoia Pitch Moth at the Big Fork Tree Improvement Area

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Sequoia pitch moth, *Synanthedon sequoiae* (SPM), attacks primarily lodgepole and ponderosa pine trees growing in seed orchards, tree improvement areas, and natural forest settings. SPM incidence and damage is usually higher at genetic test sites than in natural forest settings because trees in genetic tests are often growing off-site, which can stress and predispose them to insect and disease problems. Attacks from SPM can weaken trees, cause branch break-offs and even tree mortality when attacks result in girdling. SPM has a two-year life cycle in Montana and Idaho.

Insecticides have not proven useful in controlling attacks by SPM. Control efforts are mainly accomplished by manually removing pitch masses from individual trees, usually 2-3 times per year and destroying larvae found. This is very labor intensive and is only partially effective because not all pitch masses or larvae inside of pitch masses are found by this method.

Two alternative control methods–providing a physical barrier with tree wrap and trapping–were tested at Bigfork Tree Improvement Area (TIA) in 2014 with promising results (Sturdevant et al. 2015). The objectives of this study were to: 1) evaluate a new tree wrap and 2) conduct a second year of trapping in the same treatment block used in the 2014 study but at a reduced trap density.

Methods

Both field experiments were conducted in three lodgepole pine plantations growing in 2-acre blocks at Bigfork TIA. Blocks were located about ¼ to ½ miles apart from each other and were the same blocks that were used in the 2014 study (Sturdevant et al. 2015). All three blocks contained 175 or 178 lodgepole pine trees of similar size.

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Figure 1. Treatment tree wrapped with new, flexible tree wrap.

Tree Wrapping-Thirty treatment and control trees in the tree wrapping block were selected on June 9, 2015. Most treatment trees were the same as those used in 2014 tree wrap evaluation. All pitch masses were removed from control and treatment trees. Old wrap was removed and the new wrap (Jobes Tree Care, tree wrap) was applied to the entire bole of the tree to approximately 4.5 feet above the ground (figure 1). After moth flight, all control and wrapped trees were examined for new pitch masses and second year emerging larvae, pupae or adults along the length of the tree wrap. The Wilcoxon Rank Sums test was used to compare SPM pitch masses per tree in the controls and treatments.

Trapping-In the fall of 2014, two blocks were assessed for SPM population levels. Similar levels of new pitch mass attacks were found in the control (240) and trapping treatment (224) blocks prior to treatment. On June 8, 2015, twenty-four pheromone baited delta traps (0.5 mg of ZZ-3, 13-18OH) were placed in the trapping block on an evenly-spaced grid (approximately every 40 feet) except for in rows along the perimeter of all four sides. Traps were checked weekly for moths from June 16 through August 21 and number of moths found was recorded. Pheromone baits were replaced mid-season on July 9. After moth flight in late August, 50 trees were systematically selected (every 4th tree) in the trapping and control blocks and evaluated for new pitch masses (up to 4.5 feet above the ground). The efficacy of trapping will be evaluated over time because we only had one treatment and one control block at Big Fork TIA and no replication of blocks to compare.

Results

Both tree wrapping and trapping resulted in a reduction in the number of pitch masses found on treatment trees. Trap catches peaked on June 23. No moths were caught July 14-August 11 and only one moth was caught on August 18. A total of 112 moths were caught in the 24 traps (figure 2).

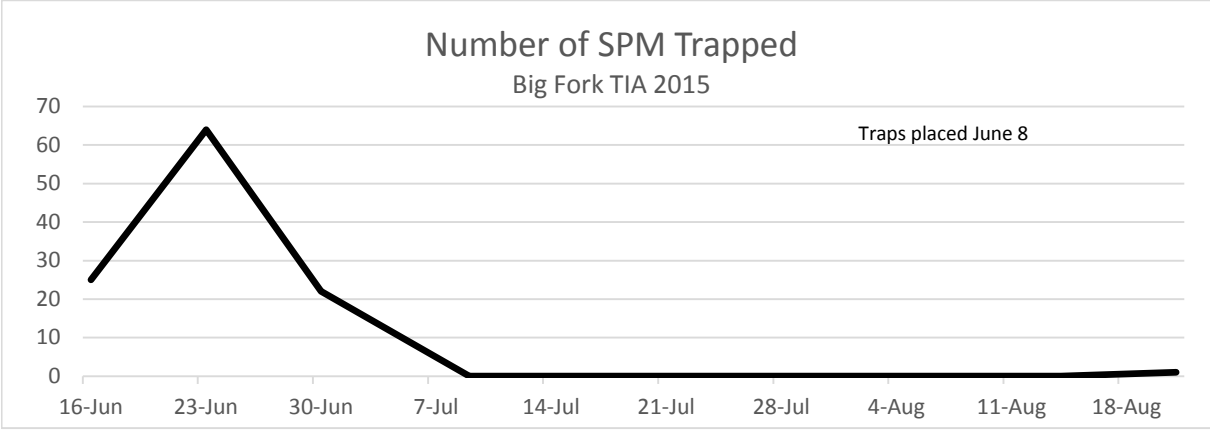

Figure 2. Number of sequoia pitch moths trapped during 2015 at the Bigfork Tree Improvement Area.

A total of 87% of wrapped trees were not attacked by SPM versus 33% of control trees in 2015. Significantly fewer pitch masses per tree were found on wrapped trees than control trees ($P < 0.001$) figure 3). Individual wrapped trees had an average of 0.13 ± 0.1 pitch masses per tree versus control trees which had an average of 1.4. ± 0.2 pitch masses per tree.

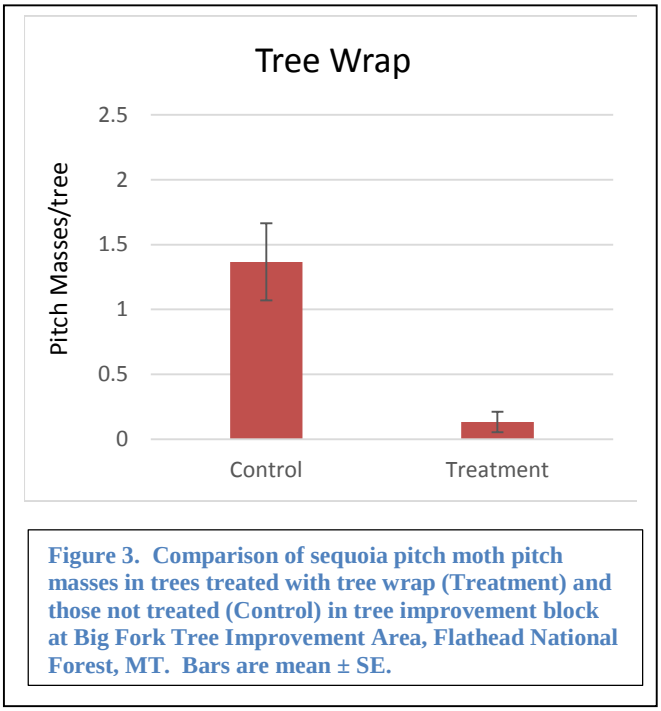

Figure 3. Comparison of sequoia pitch moth pitch masses in trees treated with tree wrap (Treatment) and those not treated (Control) in tree improvement block at Big Fork Tree Improvement Area, Flathead National Forest, MT. Bars are mean ± SE.

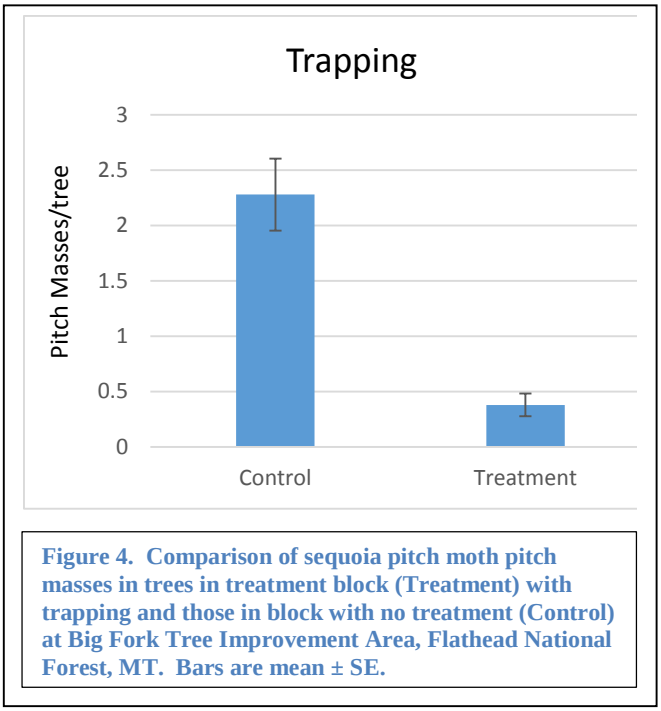

Figure 4. Comparison of sequoia pitch moth pitch masses in trees in treatment block (Treatment) with trapping and those in block with no treatment (Control) at Big Fork Tree Improvement Area, Flathead National Forest, MT. Bars are mean ± SE.

A total of 78% of trees located in the trapping block were not attacked by SPM versus 24% of trees in control blocks in 2015. Fewer pitch masses per tree were found on trees in the trapping block than trees in the control block (figure 4). Individual trees in the mass trapping block had an average of 0.38 ± 0.1 pitch masses per tree versus control trees which had an average of 2.3 ± 0.3 pitch masses per tree.

Discussion

Wrapping trees significantly reduced new attacks by SPM at the Bigfork TIA. The new tree wrap adhered much better to the boles of trees resulting in less gaps and exposed bole surface for new pitch moth attacks than the wrap used in 2014 (Tangle Guard Banding material, Contech Inc.) There are two types of protection that the tree wrap may provide. One is where the tree wrap directly protects or prevents oviposition on the boles of trees by adult moths. The second, or indirect control mechanism, is that the wrap may prevent SPM pupae from emerging and affecting SPM densities the following year. We believe both mechanisms may be at work, however, indirect method may not be as important as the direct control method because we did find a few larvae that were able to chew through the tree wrapping material and emerge from wrapped trees. Because SPM has a two year life cycle, this indicates that the emerging larvae were not a result of new attacks on the wrapped trees but were missed when pitch masses were removed before trees were wrapped.

Our trapping study was successful in reducing the number of pitch masses found on treatment trees. We caught 112 male moths in our traps. The male to female ratio for SPM is 50:50 and individual females can lay up to 50 eggs. Removing males from the SPM population probably resulted in a mating disruption effect throughout the plantation. Our results are similar to control measures for SPM achieved by California growers using a similar amount of pheromone that we used in our study (12 mg/acre) (Darek Czokajlo, personal communication 2015).

In a multi-year mating disruption study, Ward (2002) found that applying 0.6 g/hectare (243 mg/acre) of synthetic pheromone did not result in a significant reduction in number of adult moths in treatment blocks. More moths were caught in the treatment blocks versus control blocks which suggested that mating disruption was not successful. They suggested that the amount of pheromone applied could have pulled moths in from surrounding areas, masking successful mating disruption. Other studies have shown that mating disruption is an effective

control method for the peachtree borer, *Synanthedon exitiosa* (Agnello & Kain 2000) and the cherry tree borer, *Synanthedon hector* (Matsumoto et al. 2007).

Tree wrapping for SPM control is more time intensive than trapping, however, it does not need to be implemented annually. Trapping needs to be done annually and its success at reducing SPM attacks may be influenced by SPM population densities in the target area and even surrounding forests. It appears that the new tree wrap in this study could last for several years based on its condition following the 2015 field season.

In 2016, we will evaluate trapping at Bigfork using the same trap density and pheromone load as used in 2015 to determine if it produces consistent enough results to recommend for operational use. It takes several years of trapping to reduce damage from SPM because it has a 2-year life cycle. We will also evaluate the tree wrap to see how durable it is through a second field season.

Citations

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